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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ZHU, RICHARD Z	

ART UNIT	PAPER NUMBER
2625	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/589,661	SOMEYA ET AL.	
	Examiner	Art Unit	
	RICHARD Z. ZHU	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/16/2006 and 05/15/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority based on application JP 2004-044662 filed in Japanese Patent Office on 02/20/2004. Certified copy of said Japanese Application has been received.
2. Acknowledgment is made of applicant's claim for domestic priority based on PCT/JP04/09109 filed on 06/28/2004.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-4, 6-8, and 10-13 are rejected under 35 USC 103(a) as being unpatentable over ***Kobayashi (US 6714242 B1)*** in view of ***Mita (US 4776031 A).***

Regarding Claim 1, ***Kobayashi*** discloses an image scanner for scanning an image by using an image sensor **(Fig 1, image processing apparatus with CCD 12)** comprising:

an imaging unit having sensor chip **(Col 3, Rows 59-62),** the sensor chip having a plurality of imaging devices **(Fig 2, a bayer array CCD, each grid represent a device or filter for picking up pixels of respective color)**;

an A/D converter unit for converting an image signal output from the imager unit to digital pixel data (**Col 4, Rows 7-12, Signal Processing Section 13 sends digital RGB pixel information to Interpolation Section 15 and Detection Section 14, on the basis of received signal from CCD 12**);

a compensator unit for correcting for variations in characteristics of the imaging devices of the sensor chips (**Col 4, Rows 8-10, examples such as black level clamping and white balance to RGB sequential data**); and

an interpolator unit for interpolating missing pixel data (**Fig 1, Interpolation Section 15, see Col 4, Rows 37-45**);

wherein the interpolator unit performs missing pixel interpolation after the compensator unit corrects for the variations in the characteristics of the imaging devices (**Fig 1, Interpolation at Interpolation Section 15 occurs after Signal Processing Section 13 performs black level correction**).

Kobayashi does not disclose the imager unit having a plurality of sensor chips disposed in a single connected row and that the interpolator interpolates missing pixel data occurring at points where the sensor chips are mutually connected.

Mita discloses an image scanner for scanning an image by using an image sensor with a plurality of imaging devices disposed in a single row (**Fig 1, image reading apparatus**), comprising:

an imager unit having a plurality of sensor chips disposed in a single connected row, each sensor chip having a plurality of imaging devices (**Fig 3 and see Col 3, Rows 56 – 62, CCD line sensor having sensor chips 1-a, 1-b and 1-c disposed in a single connected row,**);

an A/D converter unit for converting an image signal output from the imager unit to digital pixel data (**Fig 5, A/D Converter 3**);

an interpolator unit for interpolating missing pixel data occurring at points where the sensor chips are mutually connected (**Fig 4A and see Col 3, Row 63 – Col 4, Row 3 and see Col 4, Row 65 – Col 5, Row 2, operations of Selector 9 in cooperation with register 7**).

Mita suggested that having an imager unit with a plurality of imaging devices disposed in a single row, the number of imaging devices to be formed on a single substrate is not so large and the problem of improved yield and reduced cost can be solved (**Col 1, Rows 25-32**). It would've been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus of ***Kobayashi*** to have an imager unit with the configuration of ***Mita*** in order to reduce cost and to further compensate for any deficiencies in making the modification with the interpolator taught by ***Mita*** to properly reproduce image data corresponding to gaps between a plurality of sensor chips (***Mita*****, Col 1, Rows 52-55**).

Regarding Claim 3, ***Kobayashi*** discloses wherein the interpolator unit comprises at least one mean preserving interpolation circuit for obtaining pixel data for a missing pixel by performing interpolation such that a mean value of a plurality of pixels including the missing pixel and a mean value of a plurality of pixels not including the missing pixel become equal

(Col 4, Rows 18-29 and Col 6, Rows 46 - 65, Col 8, Row 55 – Col 9, Row 8, Col 9, Row 60 – Col 10, Row 3, determining a method for interpolation on the basis of correlation coefficients, said coefficients are indicative of the characteristics of the region where the missing pixel is situated as well as its neighboring pixels. For example, for interpolating a missing pixel G22, said coefficients are determined by comparing the differences between a mean value of a plurality of pixels including G22, see equations (1) or (2), and a mean value of a plurality of pixels not including G22. Thereafter, the determined coefficients are compared with each other to determine an interpolation coefficient in each direction of the missing pixel. For example, in a non-edge region where the differences between mean values is zero or means are equal, an interpolation coefficient is interpolated to generate interpolation pixel indicative of said characteristics, thereby preserving the characteristic pertaining to mean values being equal).

Regarding Claim 4, ***Kobayashi*** discloses having a plurality of mean preserving interpolation circuits that perform interpolation at a non-missing pixel near the missing pixel (**Col 9, Row 60 – Col 10, Row 3, generate interpolation pixel data Gr, Gl, Gt, and Gb in four directions around a missing pixel G**), the results of the interpolation by each mean preserving interpolation circuit being evaluated and the mean preserving interpolation circuit giving the best result being used to perform interpolation for the missing pixel (**Col 10, Rows 4-14, the interpolation coefficients determined in the previous process is applied to Gr, Gl, Gt, and Gb, and thereafter summed to generate the interpolation pixel G. The determination process involves ranking or evaluating correlation coefficient generated by comparing the mean values of the plurality of pixels including pixel to be**

interpolated and mean values of the plurality of pixels not including pixel to be interpolated).

Regarding Claim 5, ***Kobayashi*** discloses wherein the mean preserving interpolation circuit has a circuit for limiting an output range according to maximum and minimum values of pixels neighboring the missing pixel **(Col 10, Rows 36-53, range of output interpolation coefficient is determined and therefore limited on the basis of the difference between maximum and minimum correlation values of surrounding pixels, see Fig 16**).

Regarding Claim 6, ***Kobayashi*** discloses wherein the imaging devices comprise imaging devices of a plurality of types sensitive to different colors **(Fig 2, Bayer Pattern CCD**), the plurality of types of imaging devices sensitive to different colors being disposed in a prescribed sequence **(Fig 8**), the interpolator unit performing interpolation processing on the basis of pixel data of pixels of the same color as the missing pixel **(Col 6, Rows 60-63, Equations 1-2 for interpolating green pixels. Col 6, Rows 63-65, Equations 3-4 for interpolating red pixels; see Fig 4**).

Regarding Claim 8, ***Kobayashi*** discloses a signal processing method for processing an image signal obtained by a imager unit wherein interpolation processing for missing pixels is performed after correction for variation of characteristics of the imaging devices of the sensor chips included in the image signal **(See rejection of Claim 1 and see Fig 1, interpolation is performed after signal processing section completes at least black level and white balance corrections**).

Kobayashi does not disclose the imager unit having a plurality of sensor chips disposed in a single connected row and that the interpolator interpolates missing pixel data occurring at points where the sensor chips are mutually connected.

Mita discloses an image scanner for scanning an image by using an image sensor with a plurality of imaging devices disposed in a single row (**Fig 1, image reading apparatus**), comprising:

an imager unit having a plurality of sensor chips disposed in a single connected row, each sensor chip having a plurality of imaging devices (**Fig 3 and see Col 3, Rows 56 – 62, CCD line sensor having sensor chips 1-a, 1-b and 1-c disposed in a single connected row,**);

an interpolator unit for interpolating missing pixel data occurring at points where the sensor chips are mutually connected (**Fig 4A and see Col 3, Row 63 – Col 4, Row 3 and see Col 4, Row 65 – Col 5, Row 2, operations of Selector 9 in cooperation with register 7**).

Mita suggested that having an imager unit with a plurality of imaging devices disposed in a single row, the number of imaging devices to be formed on a single substrate is not so large and the problem of improved yield and reduced cost can be solved (**Col 1, Rows 25-32**). It would've been obvious to one of ordinary skill in the art at the time of the invention to modify the apparatus of ***Kobayashi*** to have an imager unit with the configuration of ***Mita*** in order to reduce cost and to further compensate for any deficiencies in making the modification with the interpolator taught by ***Mita*** to properly reproduce image data corresponding to gaps between a plurality of sensor chips (***Mita*****, Col 1, Rows 52-55**).

Regarding Claim 10, see rejection of Claim 3 and its accompanying analysis.

Regarding Claim 11, ***Kobayashi*** discloses wherein interpolation is performed for a non-missing pixel near the missing pixel using different numbers of pixels (**Col 8, Rows 32-45, uses pixels constituting right side, left side, upper side, and lower side relative to the pixel to be interpolated to generate respective correlation values in four directions; i.e., correlation being the difference between mean value of pixels including the pixel to be interpolated and mean value of pixels excluding the pixel to be interpolated**), the interpolation results are evaluated (**Col 8, Rows 45-55, determining a correlation mode by evaluating the correlation values**), and the interpolation for the missing pixel is performed using a number of pixels equal to the number of pixels determined to produce the best result (**Col 9, Rows 1-9, calculating interpolation coefficient on the basis of determined correlation mode. Col 9, Row 38 – Col 10, Row 14, said coefficient being multiplied with interpolation data in respective directions, the interpolation data are generated on the basis of the same pixels used in the evaluation process, to produce the best interpolation result**).

Regarding Claim 12, see rejection of Claim 5 and its accompanying analysis.

Regarding Claim 13, see rejection of Claim 7 and its accompanying analysis.

5. Claims 2 and 9 are rejected under 35 USC 103(a) as being unpatentable over the combination of ***Kobayashi (US 6714242 B1)*** and ***Mita (US 4776031 A)*** in view of ***Asai et al. (US 6271933 B1).***

Regarding Claims 2 and 9, ***Kobayashi*** discloses wherein the compensator unit corrects for black level variations among the imaging devices (**Col 4, Rows 8-12**).

Kobayashi did not suggest that it would thereafter correct for sensitivity variations.

Asai discloses a scanner comprising a compensator unit that corrects for black level variation among CCD line sensors and then correct for sensitivity variations (**Col 7, Rows 48-52**).

It would've been obvious to one of ordinary skill in the art at the time of the invention to modify the signal processing section of ***Kobayashi*** with the function of shading correction circuit of ***Asai*** to further correct for sensitivity variation in order to perform the desired shading correction to ensure high quality and color balanced output signals.

6. Claim 5 is rejected under 35 USC 103(a) as being unpatentable over the combination of ***Kobayashi (US 6714242 B1)*** and ***Mita (US 4776031 A)*** in view of ***Hershman (US 4092725 A).***

Regarding Claim 5, ***Kobayashi*** does not disclose wherein signals from different parts of the image sensor are output in parallel, and the A/D converter unit includes a plurality of sample-hold circuits for sampling and holding the signals output in parallel, a switch for sequentially selecting outputs of the plurality of the sample-hold circuits, and an analog-to-digital (A/D) converter for A/D conversion of the output of the switch.

Mita discloses a CCD system comprising a plurality of CCD sensor chips having imaging devices (**Fig 1**) wherein signals from different parts of the sensor are output in

parallel (**Fig 1, Output of CCD transversal filters in parallel**), and an A/D converter unit (**Fig 1, Transform System 10**) includes a plurality of sample-hold circuits for sampling and holding the signals output in parallel (**Fig 1, Sample and Hold Circuits 30**), a switch for sequentially selecting outputs of the plurality of the sample-hold circuits, and an analog-to-digital (A/D) converter for A/D conversion of the output of the switch (**Col 3, Rows 64-68, it appears that A/D Converter 60 not only converts parallel data into serial output, it substantially perform the function of switch for sequentially selecting outputs from the parallel inputs in order to perform serial conversion**).

It is well known in the art that Hadamard transform are advantageously applied in digital signal processing for transforming data from time domain into frequency domain. Therefore, one of ordinary skill in the art at the time of the invention, utilizing the base signal processing section of ***Kobayashi***, which is ready for improvement, to modify it to process signal in the architecture suggested by Hershman in order to take advantage of Hadamard transform.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- US 6567192 B1 discloses an interpolation apparatus that calculates the mean values of a plurality of pixels neighboring a pixel to be interpolated, evaluate the mean values by deriving the differences between the mean values, and decide a best method of interpolation.

- US 6707937 B1, US 6724945 B1, US 6882364 B1 discloses interpolation apparatus that performs interpolation on the basis of evaluating edge gradient information, which is derived from measuring the characteristics of pixels neighboring and including a pixel to be interpolated.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Richard Z. Zhu whose telephone number is 571-270-1587 or examiner's supervisor King Y. Poon whose telephone number is 571-272-7440. Examiner Richard Zhu can normally be reached on Monday through Thursday, 0630 - 1700.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RZ[2]
11/24/2009

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